

Device and method for determining tone ringing frequency

PATENT CLAIMS

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1. A method for determining tone ringing frequency, with the following steps:

10 forming a ZC signal from a tone ringing signal by comparing the tone ringing signal with a threshold (S), the ZC signal having a succession of alternately rising and falling edges between two ZC signal values;

15 measuring the respective time duration between the adjacent rising and falling edges of the ZC signal;

comparing the measured time durations with a predetermined time duration limit value ( $t_g$ );

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defining an evaluation start time ( $t_1$ ) if a measured time duration is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation start time ( $t_1$ ) being the instant of the subsequent edge;

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defining an evaluation stop time ( $t_2$ ) if a measured time duration with an identical ZC signal value to the next-but-one instance is greater than or equal to the time duration limit value ( $t_g$ ),

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determining the frequency (f) on the basis of the  
5 measured time difference between the evaluation  
start time ( $t_1$ ) and the evaluation stop time ( $t_2$ ).

defining a monitoring time window ( $T_u$ ,  $T_o$ ) for the frequency determination; and

3. The method for determining tone ringing frequency as claimed in one of the preceding claims, characterized in that the time duration limit value ( $t_a$ ) is defined as a constant.

4. The method for determining tone ringing frequency  
25 as claimed in either of claims 1 and 2  
characterized in that a value which is as great as  
possible is defined for the time duration limit  
value ( $t_g$ ), with which the attempt to define the  
evaluation start time ( $t_1$ ) is commenced; and this  
30 value is reduced in accordance with a predetermined  
algorithm if no evaluation start time ( $t_1$ ) can be  
defined after a certain time.

5. A device for determining tone ringing frequency, with:

5 a ZC signal generating means for forming a ZC signal from a tone ringing signal by comparing the tone ringing signal with a threshold (S), the ZC signal having a succession of alternately rising and falling edges between two ZC signal values;

10 a measuring means for measuring the respective time duration between the adjacent rising and falling edges of the ZC signal;

15 a comparison means for comparing the measured time durations with a predetermined time duration limit value ( $t_g$ );

a defining means for defining

20 i) an evaluation start time ( $t_1$ ) if a measured time duration is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation start time ( $t_1$ ) being the instant of the subsequent edge;

25 ii) defining an evaluation stop time ( $t_2$ ) if a measured time duration with an identical ZC signal value to the next-but-one instance is greater than or equal to the time duration limit value ( $t_g$ ), the evaluation stop time ( $t_2$ ) being the instant of the subsequent edge;  
30 and

a frequency-determining means for determining the frequency ( $f$ ) on the basis of the measured time difference between the evaluation start time ( $t_1$ ) and the evaluation stop time ( $t_2$ ).

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6. The device for determining tone ringing frequency as claimed in claim 5, characterized in that the defining means for defining a monitoring time window ( $T_u$ ,  $T_o$ ) is designed for the frequency determination and for discontinuing the measurement if the time measured since the evaluation start time ( $t_1$ ) lies outside the monitoring time window.

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7. The device for determining tone ringing frequency as claimed in either of the preceding claims 5 and 6, characterized in that the defining means defines the time duration limit value ( $t_g$ ) as a constant.

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8. The device for determining tone ringing frequency as claimed in either of claims 5 and 6, characterized in that the defining means defines a value which is as great as possible for the time duration limit value ( $t_g$ ), with which the attempt to define the evaluation start time ( $t_1$ ) is commenced; and this value can be reduced in accordance with a predetermined algorithm if no evaluation start time ( $t_1$ ) can be defined after a certain time.

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